

# NATAL DOWN AND EGG SIZE OF THE KOKAKO *CALLAEAS CINEREA* (AVES: CALLAEIDAE)

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*Abstract.* A full-term embryonic Kokako *Callaeas cinerea* had 11 well-developed patches of natal down. These included all eight main down-patches noted on two New Zealand passerines previously studied by the author (Grey Warbler *Gerygone igata* and Whitehead *Mohoua albicilla*), plus the caudal, primary and crural patches. Twelve Kokako eggs were 34.2-42.1 mm long and 25.7-29.2 mm wide. It seems likely that South Island eggs are slightly larger on average than those from the North Island.

In December 1992, while studying the nesting of North Island Kokakos *Callaeas cinerea wilsoni* (Callaeidae) at Rotoehu Forest north of Rotorua, J.G. Innes obtained a full-term embryo that died while emerging from its egg. This embryo (now held at Auckland Museum, reg. no. B3685) has afforded me the opportunity of determining the arrangement of natal down. This is a character that may prove helpful in elucidating taxonomic relationships (Wetherbee 1957). To date among New Zealand passerines the arrangement of natal down has been described for only two other species, the Grey Warbler *Gerygone igata* (Gill 1983) and Whitehead *Mohoua albicilla* (Gill 1993).

During field work, J.G. Innes and P. Bradfield obtained some addled North Island Kokako eggs for Auckland Museum. As so little has been published on the breeding of this difficult species, I have summarised the length and breadth measurements of Kokako eggs held by Auckland Museum (AIM) and the Museum of New Zealand (MONZ) or described in the literature. There are no Kokako eggs at present in the collections of Canterbury Museum, Christchurch (G. Tunnicliffe, pers. comm.), or Otago Museum, Dunedin (J. Darby, pers. comm.).

An egg obtained in the Orongorongo Ranges near Wellington in 1875 (Table 1) was thought to belong to the Huia *Heteralocha acutirostris* (Buller 1876) but later re-identified as a Kokako egg (see Buller 1888). It contained a full-term embryo, and Buller (1876) gave the following superficial account of the natal down: "The whole of the body is bare, with the exception of what appears [*sic*] (in spirits) to be strips of coarse hair-like filaments, from one-half to three-quarters of an inch in length, and perfectly black, but are in reality tufts of extremely fine downy feathers. A strip of these filaments encircles the crown, a line passes down the course of the spine, and there is another along the outer edge of each wing and behind each thigh." The present paper confirms the general accuracy of this description.

## NATAL DOWN

### COLOUR

The down of embryo B3685 is dark grey, almost black, while wet, and paler grey when dry and fluffed out. Potts (1874: 147) described nestlings in a nest at Milford Sound, as

Table 1. Measurements (mm) of 12 Kokako eggs, all from the North Island except the first three.

Reg. No. or Authority	Locality	Date	Length	Breadth
Buller (1888)	Westland	c. 1874	40.6	29.2
"	"	"	41.9	27.9
MONZ 7626	Hokitika	c. 1880	42.1	27.2
Buller (1876)	Orongorongos	Oct. 1875	36.8	26.7
Oliver (1955)	Hunuas	Nov. 1887	36.0	26.5
MONZ unreg.	Mapara	Feb. 1992	37.4	26.0
MONZ unreg.	"	Feb. 1992	-	26.7
AIM B1579a	Rotoehu	Feb. 1990	38.0	27.4
AIM B3626a	"	Dec. 1991	37.0	25.7
AIM B3684a	"	Feb. 1993	34.2	26.3
AIM B3684b	"	Feb. 1993	35.3	26.9
AIM B5672	Mapara	Jan. 1993	41.4	26.7

“partially clothed with slate-coloured down”. Chicks in a nest east of Auckland had “dark brown” down (McKenzie 1951).

#### DISTRIBUTION

The natal down feathers (neossoptiles) of passerines seem to be distal extensions of some (not all) of the teleoptiles that develop later during the nestling period (see Wetherbee 1957). The downs occur in regions or patches for the names of which I have chosen from among those used by Saunders (1956) and Wetherbee (1957).

Fig. 1 shows the eleven down patches present on the Kokako embryo. In general I have not followed Wetherbee (1957) in counting the exact number of downs and showing their orientation. The Kokako embryo is fixed in the curled foetal position, making examination difficult, and has already lost some down through abrasion.

The ocular patches, dorso-posterior to the eyelids, comprise two (on one side) and three (on the other) small downs no longer than 3 mm. The coronal and occipital patches are greatly developed, almost completely encircling the top of the head with more than 90 downs up to about 10 mm long. It is difficult to see where the coronal patches end and the occipital begins. These patches have a complicated disposition of individual downs, which in places seem to form clusters rather than simple rows.

The spinal patch runs from about the level of the posterior edge of the wing stumps to the tail base. It contains more than 50 downs up to 14 mm long. Anteriorly and posteriorly it forms a double row of downs but at about the mid-point it swells to a wider cluster of downs.

The caudal patches are conspicuously represented by four short downs (up to about 6 mm long) at each side of the tail base. These presumably correspond to the upper rectrix coverts. About 1 mm inferior to these a row of 12 very short downs (1-2 mm long) running from side

to side along the posterior edge of the tail base represents the tips of the rectrices. Inferior to these again a row of very short downs must be the undertail coverts.

Each humeral patch is a double row of nine (i.e.  $2 \times 9 = 18$ ) downs that are up to about 13 mm long. The secondary and primary patches are more or less continuous. Each secondary patch has three rows of about 30 downs in total. The longest downs (up to about 9 mm) are on the two rows lying more dorsally along the surface of the wing. These are presumably upperwing coverts. The most ventral row has mostly short downs (c. 2 mm) and these probably represent the secondary remiges. Each primary patch comprises a double row of about 20 short downs no longer than about 2 mm. These seem to be the primary remiges and a row of coverts. There are three microscopic downs on the alula.

The femoral patches contain about 40 long downs (up to 10 mm long) arranged in four rows. Crural down is scattered on the forward, rear and outer side of the leg at the region corresponding with the distal end of the tibiotarsus. There are about 35 downs on each leg, up to 10 mm long.

The abdominal patches are postero-ventral to the point of insertion of the legs. Each comprises one row of about 10 short downs up to about 4 mm long.

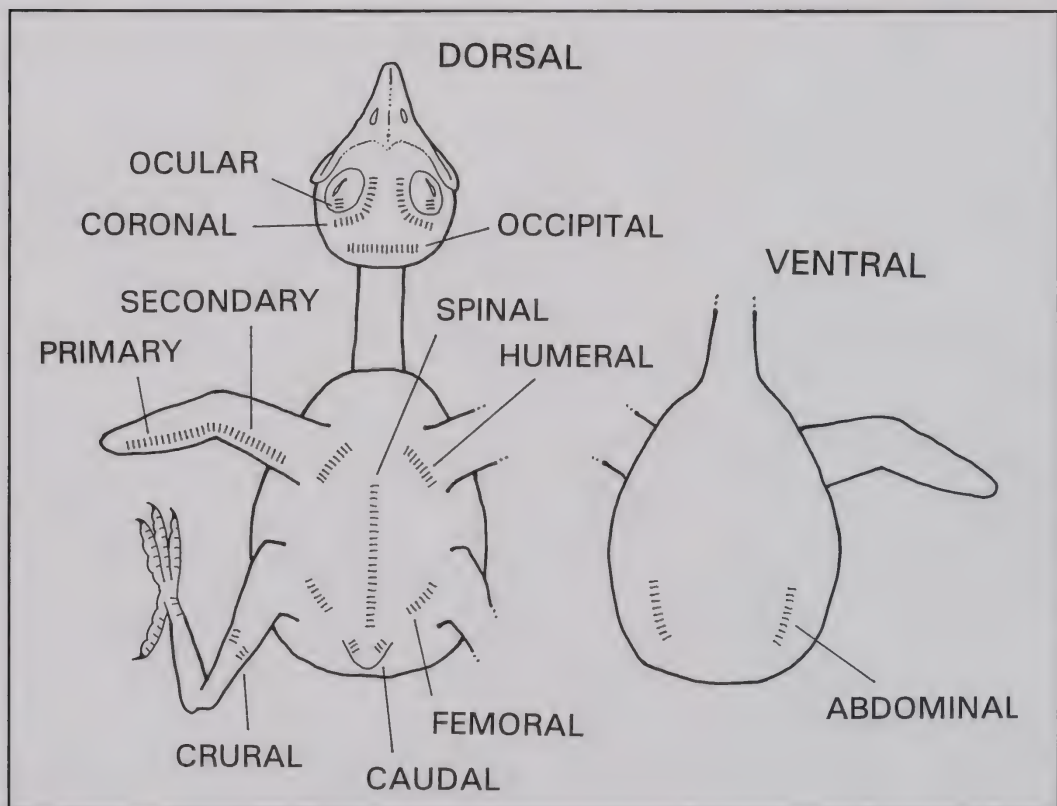


Fig. 1. Down patches of the Kokako *Callaeas cinerea* shown schematically. This diagram does not show the number or precise arrangement of the downs.



## EGGS

*South Island Kokako* (*Callaeas cinerea cinerea*)

Potts (1874: 147) gave the measurements of two eggs from a nest found near the Paringa River, Westland, as 1 inch 7 lines (40.2 mm) x 1 inch 1 line (27.5 mm). I take this to be an approximation for the size of both eggs. These are apparently the same two eggs that according to Buller (1888: 6) were presented by Potts to Canterbury Museum and were measured by Buller: his measurements were 1.60 inches (40.6 mm) x 1.15 inches (29.2 mm) and 1.65 inches (41.9 mm) x 1.10 inches (27.9 mm). My measurements of an egg in the Museum of New Zealand (MONZ 7626) from Hokitika, Westland, are given in Table 1. This is presumably the egg from Ko-i-te-rangi (Kowhitirangi) Hill on the Hokitika River, presented to the Colonial Museum by Campbell (1880). South Island eggs are therefore 40.6-42.1 mm long by 27.2-29.2 mm wide.

*North Island Kokako* (*Callaeas cinerea wilsoni*)

Measurements of nine North Island eggs are given in Table 1, all measured by me except for the two reported by Buller (1876) and Oliver (1955). North Island eggs are 34.2-41.4 mm long by 25.7-27.4 mm wide. The average length is 37.01 mm (s.d. = 2.148, n = 8). The average width is 26.54 mm (s.d. = 0.500, n = 9). Eggs from the North Island appear to be slightly smaller than those from the South Island, but more data from the latter are needed to confirm this. Embryo B3685 and its yolk sack has a wet weight (drained of surplus preserving fluid) of 6.7 g. Kokako eggs are likely to weigh at least this much.

## DISCUSSION

All 11 down patches of the Kokako are well developed, comprising numerous, relatively long, darkly coloured downs. The least developed is the ocular. In both the Grey Warbler and Whitehead there are only eight sizable and consistently present patches (Gill 1983, 1993), the same eight in both cases. All these occur in the Kokako with the addition of the caudal and primary patches (lacking in the other two species) and the crural patch. The crural is strongly developed in the Kokako but absent in most Grey Warblers, minute where it does occur, and weakly developed in the two Whiteheads examined.

The natal down of more New Zealand passerines must be studied before any useful interspecific comparisons can be made. That the three species discussed above show both similarities and differences gives hope that natal down may be a helpful taxonomic character in New Zealand. The most interesting comparisons may be between New Zealand and Australian birds. The natal down of Whiteheads ought to be closer to that of *Pachycephala* than to *Malurus*, if Whiteheads are indeed in the Pachycephalidae rather than the Maluridae. A comparison between the natal down of *Callaeas* and *Aplonis* may help to determine how close the Callaeidae is to the Sturnidae.

The larger size of South Island eggs, if real, would be consistent with Bergmann's Rule which states that among the forms of a polytypic species body-size tends to be larger in cooler parts of the range (Campbell & Lack 1985). The bill is longer in the South Island race (Oliver 1955), but other body dimensions are similar.

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## REFERENCES

BULLER, W.L.

1876 On the nesting habits of the Huia (*Heteralocha acutirostris*). *Trans. NZ Inst.* 8:192-193.

1888 *A History of the Birds of New Zealand*. Vol. 1. 2nd ed. Privately published, London.

CAMPBELL, B. and E. LACK (eds)

1985 *A Dictionary of Birds*. Poyser, England.

CAMPBELL, W.D.

1880 Notes on the nesting habits of the Orange-wattled Crow. *Trans. NZ Inst.* 12:249-250.

GILL, B.J.

1983 Breeding habits of the Grey Warbler (*Gerygone igata*). *Notornis* 30:137-165.

1993 Notes on the nesting and longevity of Whiteheads. *Notornis* 40:141-143.

McKENZIE, H.R.

1951 Breeding of Kokako. *Notornis* 4:70-76.

OLIVER, W.R.B.

1955 *New Zealand Birds*. Reed, Wellington.

POTTS, T.H.

1874 On the birds of New Zealand. Part 4. *Trans. N.Z. Inst.* 6:139-153.

SAUNDERS, A.A.

1956 Descriptions of newly-hatched passerine birds. *Bird-Banding* 27:121-128.

WETHERBEE, D.K.

1957 Natal plumages and downy pteryloses of passerine birds of North America. *Bull. Amer. Mus. Nat. Hist.* 113:339-436.

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